

Understanding the Links between WASH & Child Nutrition - Part I

Thursday, November 3, 2022 | 8:00-9:00 am ET



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PRO-WASH
Practices, Research and Operations
in Water, Sanitation and Hygiene

BEFORE WE BEGIN...

Everyone must select a language!

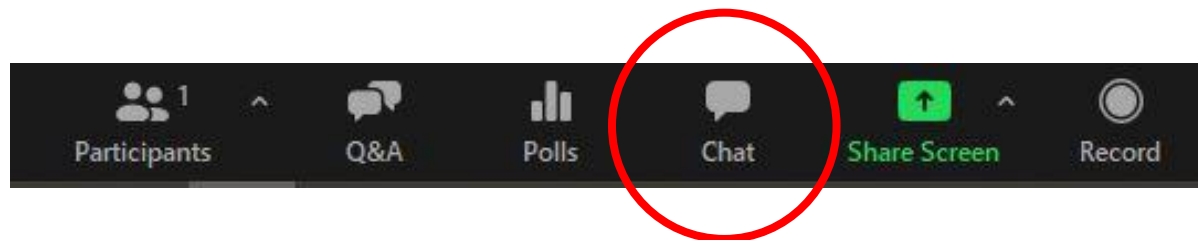
Click “interpretation” at the bottom of your Zoom window and select English or French.

Chacun doit choisir une langue !

Cliquez sur « interprétation » au bas de votre écran Zoom et sélectionnez anglais ou français.



Post your questions in the chat box at the bottom of your screen.



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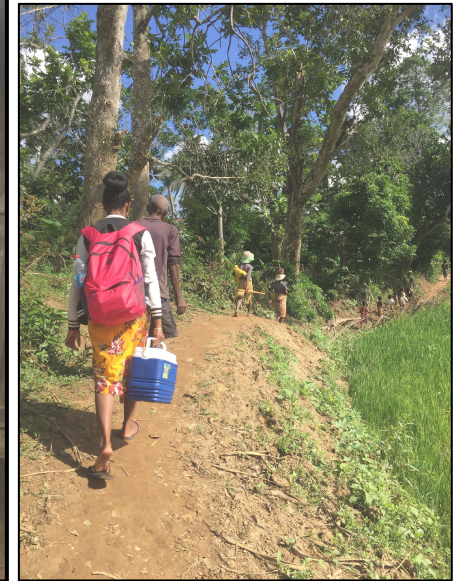
Deputy
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PATHOGEN PATHWAYS STUDY FOR CHILDREN UNDER 2 YEARS IN THE FIOVANA INTERVENTION AREAS OF SOUTHEASTERN MADAGASCAR

Presented by Aquaya



Why study fecal pathogen exposure pathways in Madagascar?

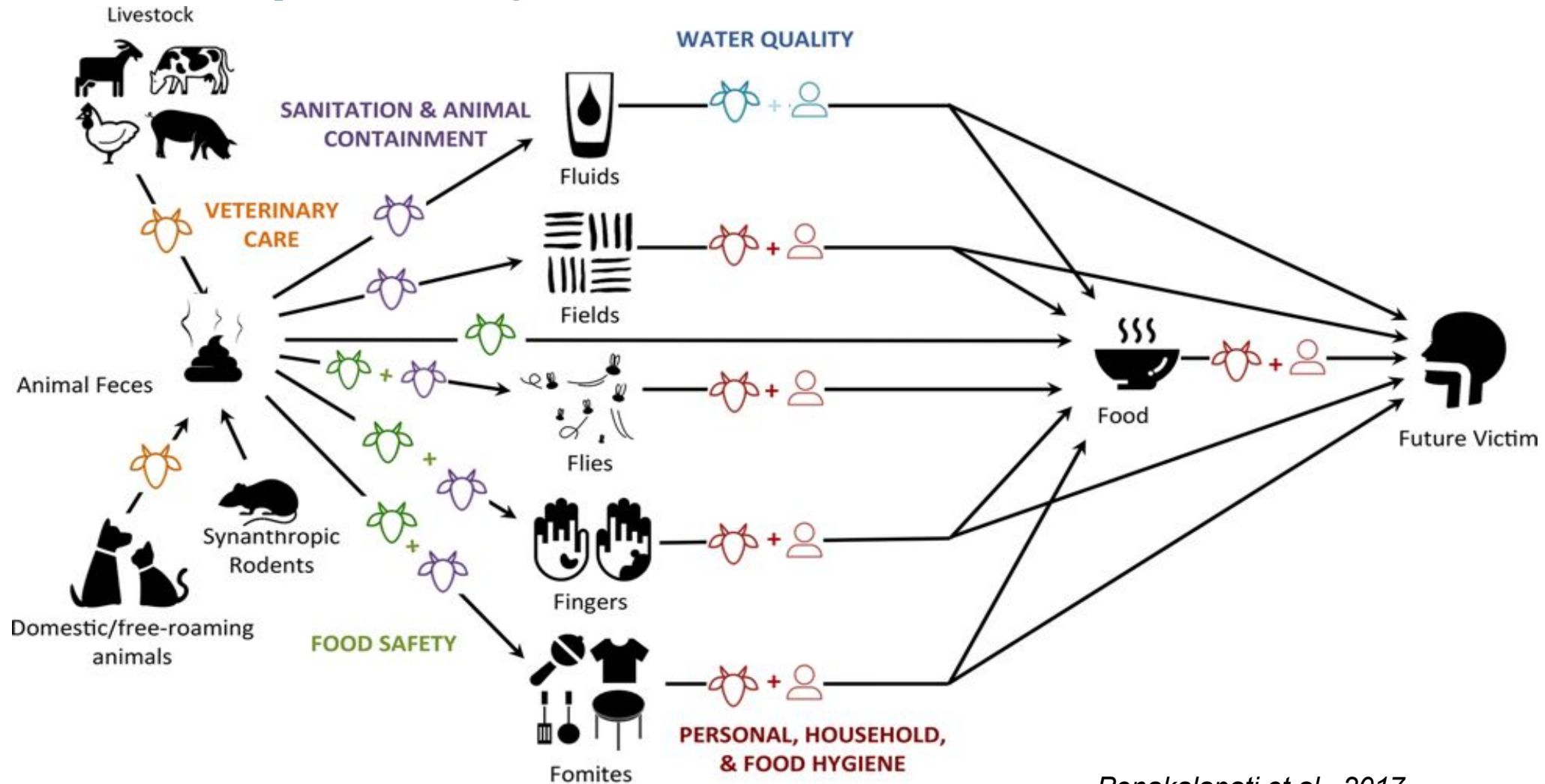
- Exposure to human and animal feces causes enteric infections and can lead to diarrhea, which is the third-leading cause of mortality and morbidity among children worldwide.
- In Madagascar, 50% of children under five tested positive for pathogenic intestinal microorganisms,¹ increasing risks for their immediate and long-term health.
- Among children under five, 50% are stunted² and the mortality rate is high (62/1000 at national scale).³

¹ *Randremanana et al., 2017*

² *UNICEF – MICS 2019*

³ *UNICEF – WASH investment case 2017*

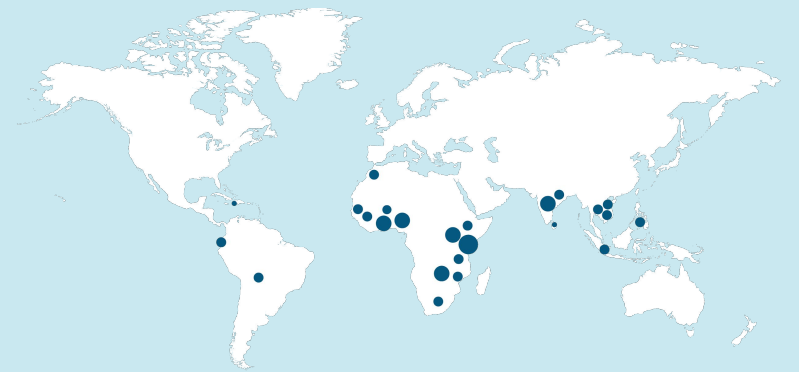
A number of pathways can result in exposure to fecal pathogens.



Research Questions

- 1) *What are the main ingestion pathways of fecal pathogens (both human and animal) for children under the age of two in implementation areas of the FIOVANA project?*
- 2) *What interventions could potentially interrupt these transmission pathways, considering the specific implementation challenges (e.g., topography and climate) and unique cultural and social norms of Southeastern Madagascar?*

Methods



Summary

Following a phased approach to field work, we assessed risks associated with different fecal exposure pathways.

Field work Phase I – 35 households pre- and post-cyclone*

- Survey (1 h)
- Structured observations (2-4 h)
- *E. coli* sampling (142 samples)

Field work Phase II – 185 households

- Survey (50 min)
- Spot observations (5-15 min)
- *E. coli* (N=717) and pathogen (N=118) sampling

Statistical analysis

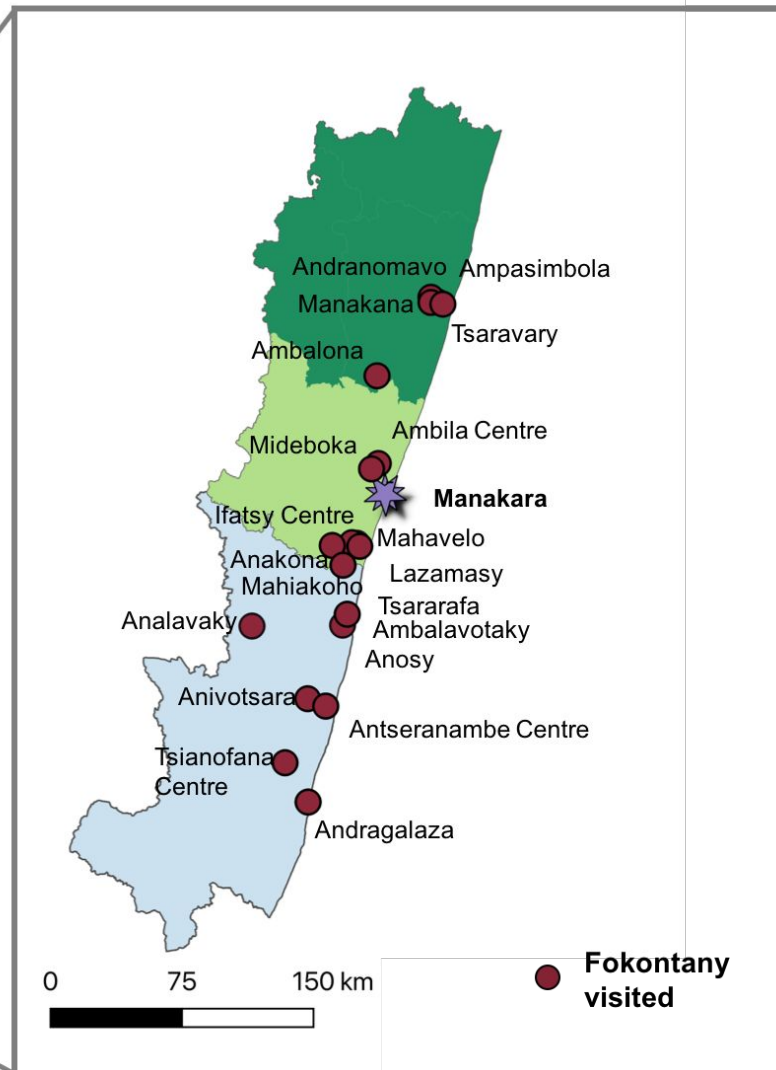
- QMRA (Quantitative Microbial Risk Assessment)
- Assessment of the risk of infection and illness associated with different exposure pathways

Recommendations and dissemination

- Report & Brief
- Workshop for local stakeholders

* Two major cyclones forced us to pause Phase I and restart several months later.

Our study area spanned three regions of Southeastern Madagascar.

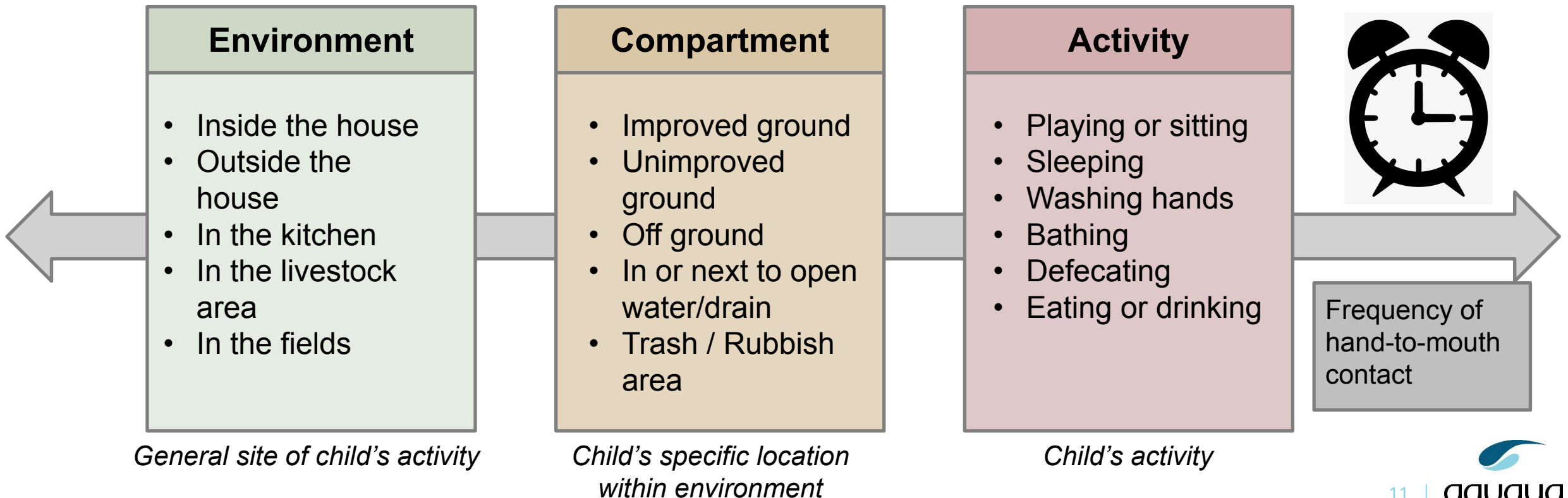


21 Fokontany (i.e., villages) visited

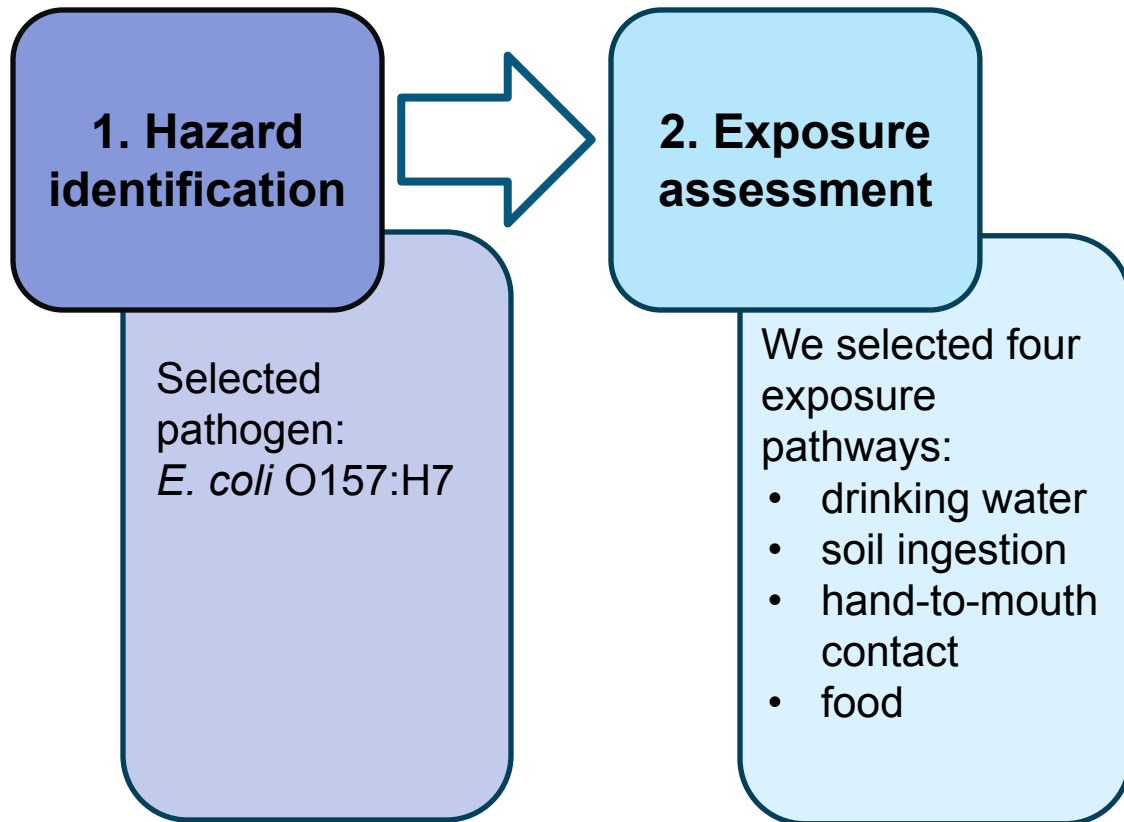
- Phase I January: 4 Fokontany (15 households)
- Phase I May: 10 Fokontany (all different from January; 20 households)
- Phase II: 17 Fokontany (7 of which were new; 187 households)

Structured observations

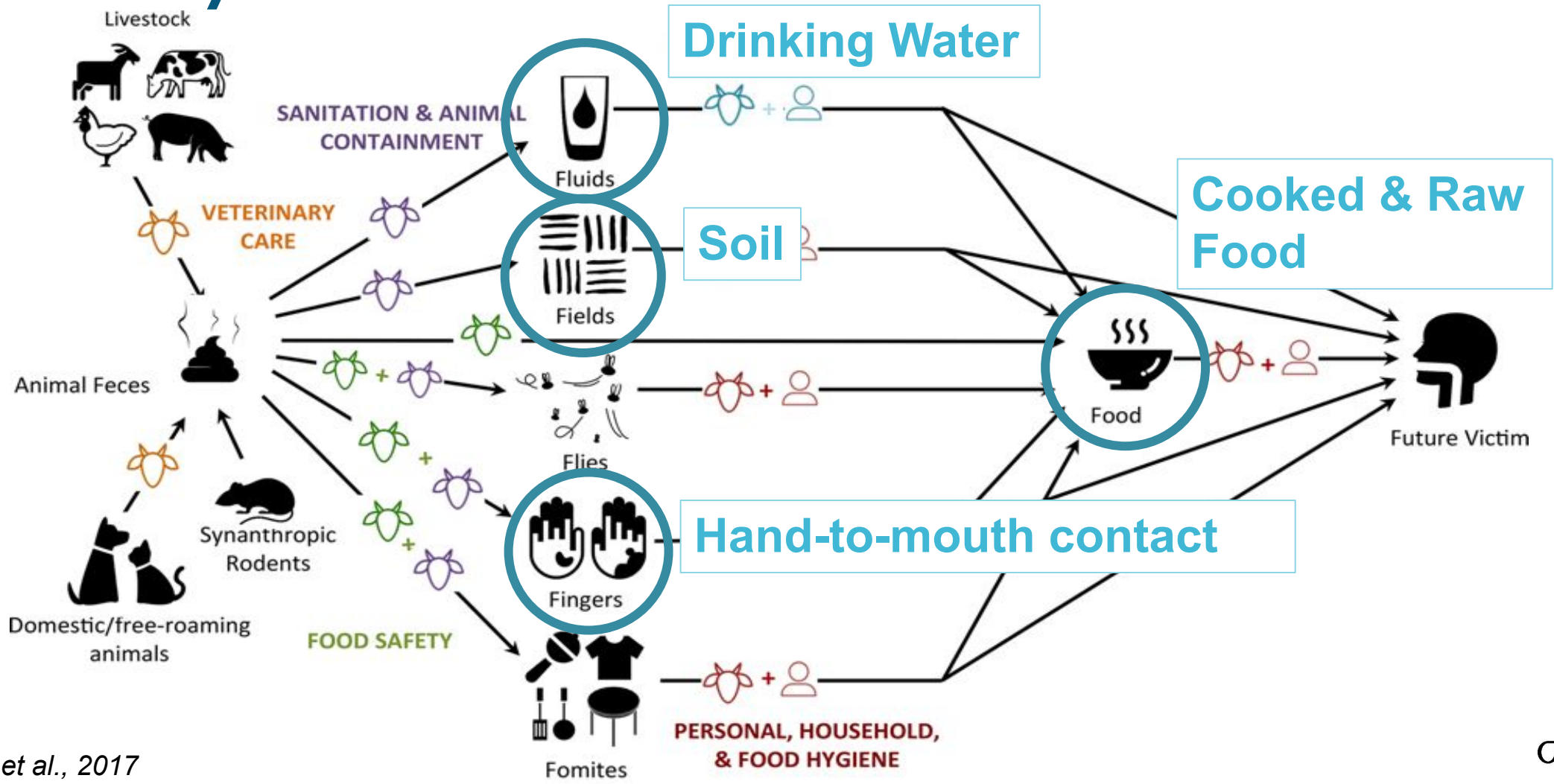
□ Understanding children's behaviors to develop appropriate recommendations



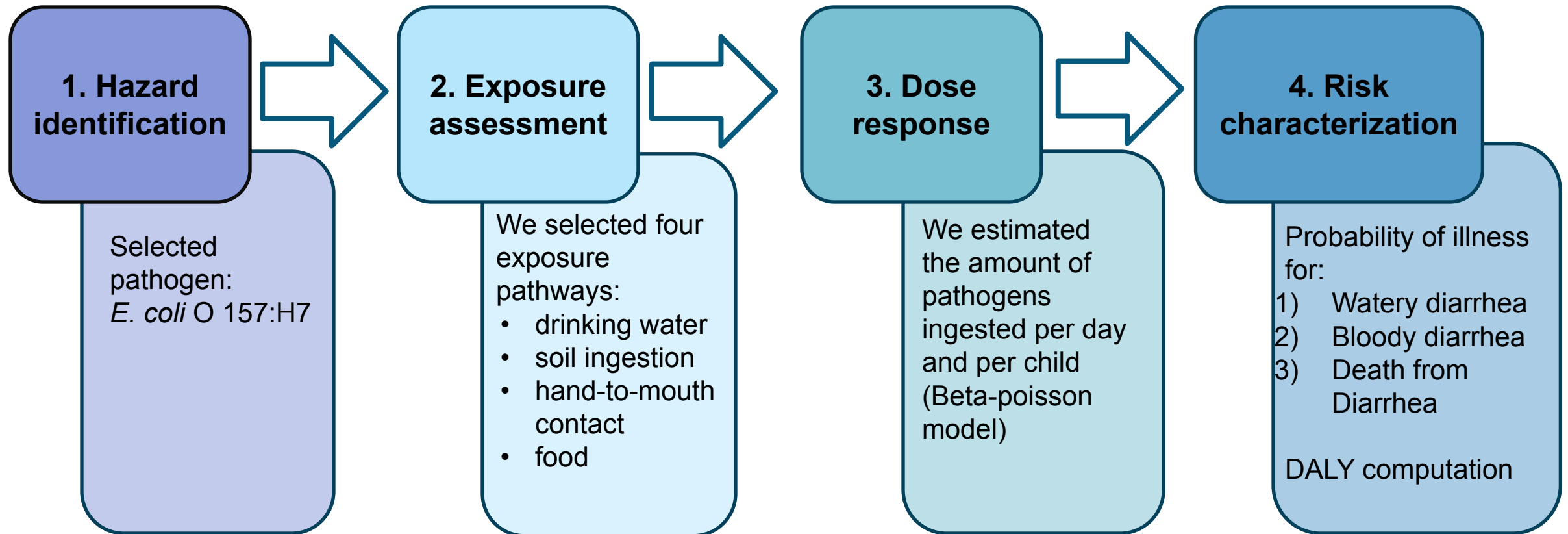
QMRA – Quantitative Microbial Risk Assessment



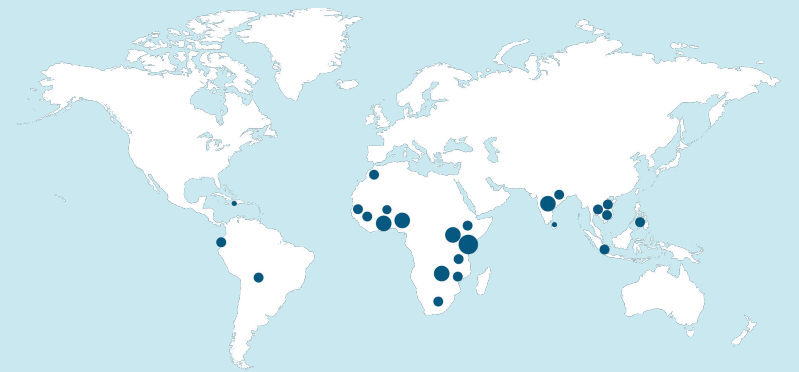
Exposure assessment: selected exposure pathways



QMRA – Quantitative Microbial Risk Assessment



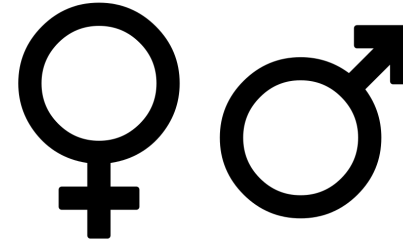
Results



Observed Household Statistics

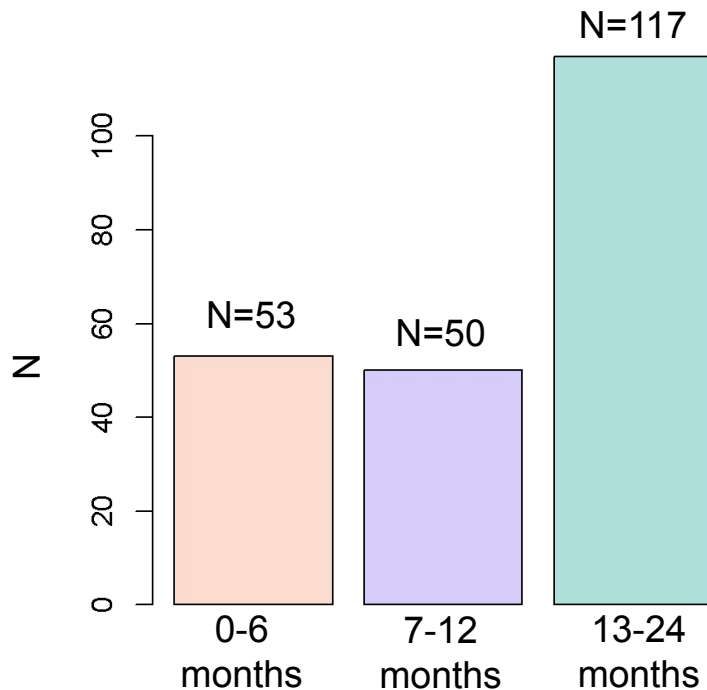


220 households studied (15 pre-cyclone;
20 post-cyclone and 185 for phase II)

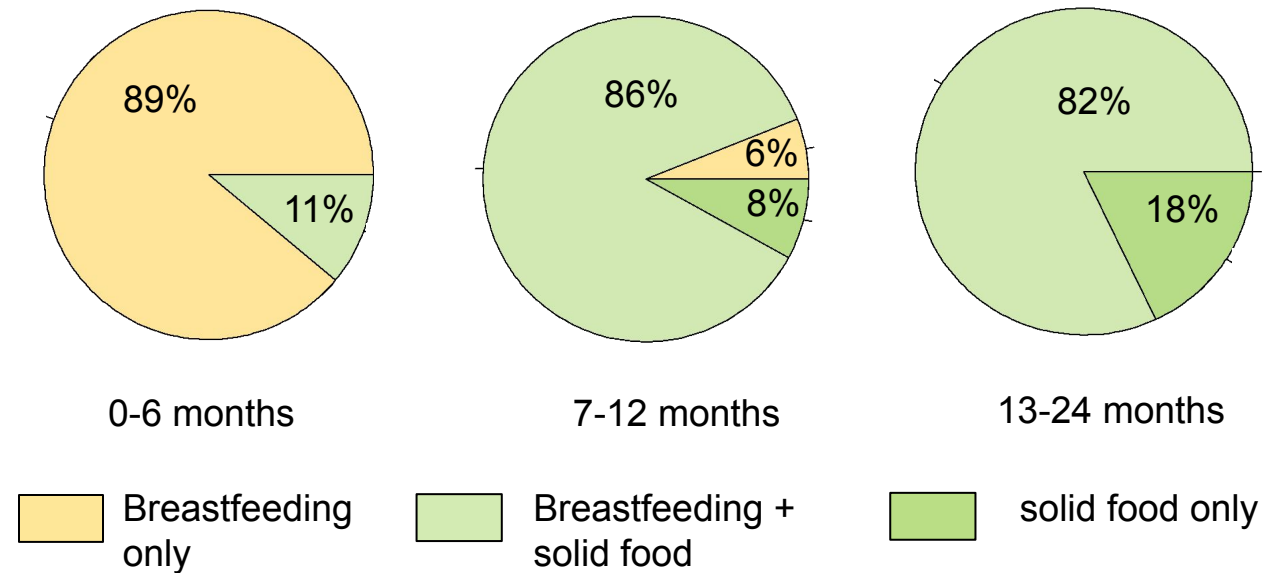


57% girls
43% boys

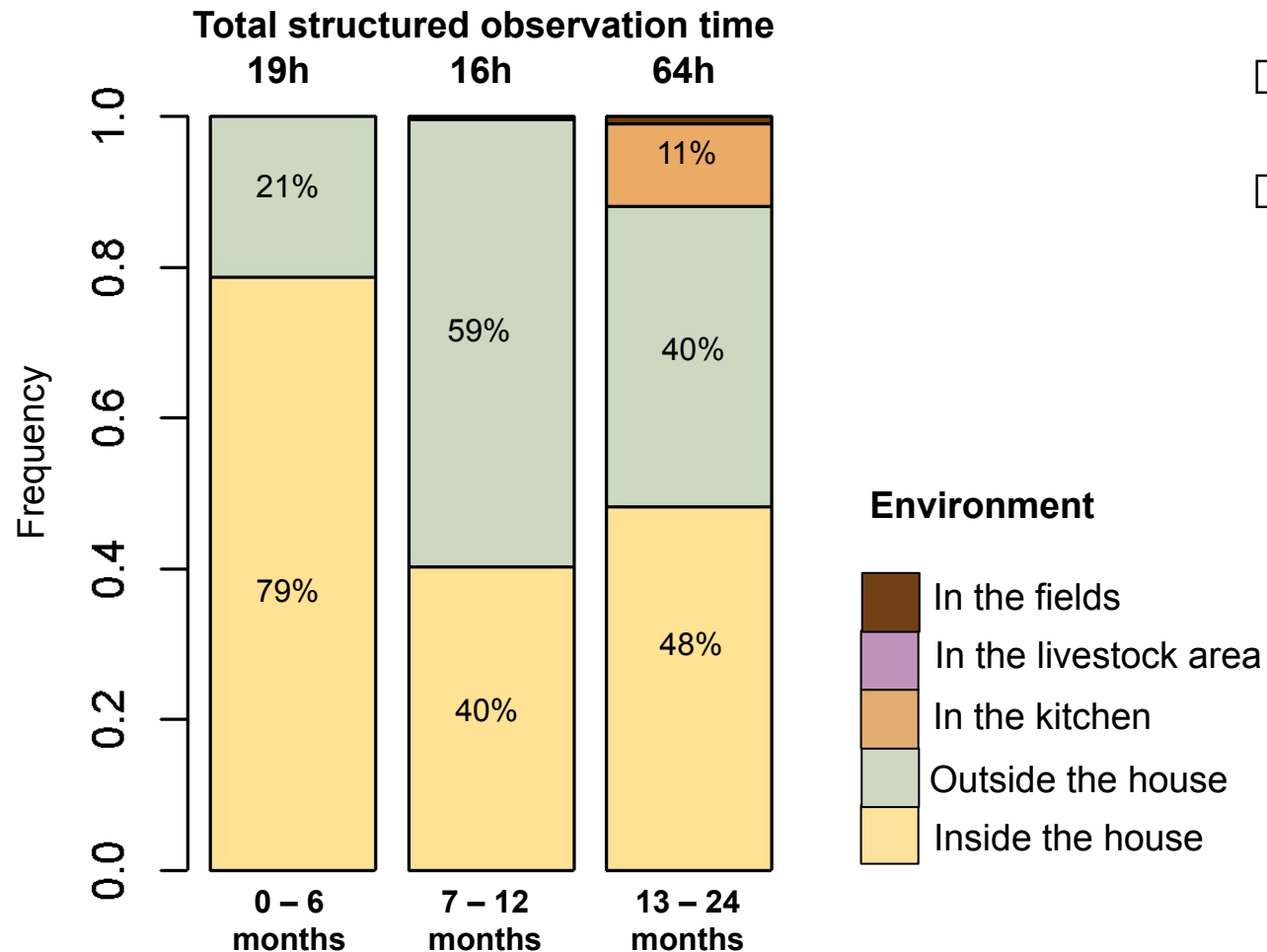
Number of children per age category



Percentage of children breastfeeding per age category

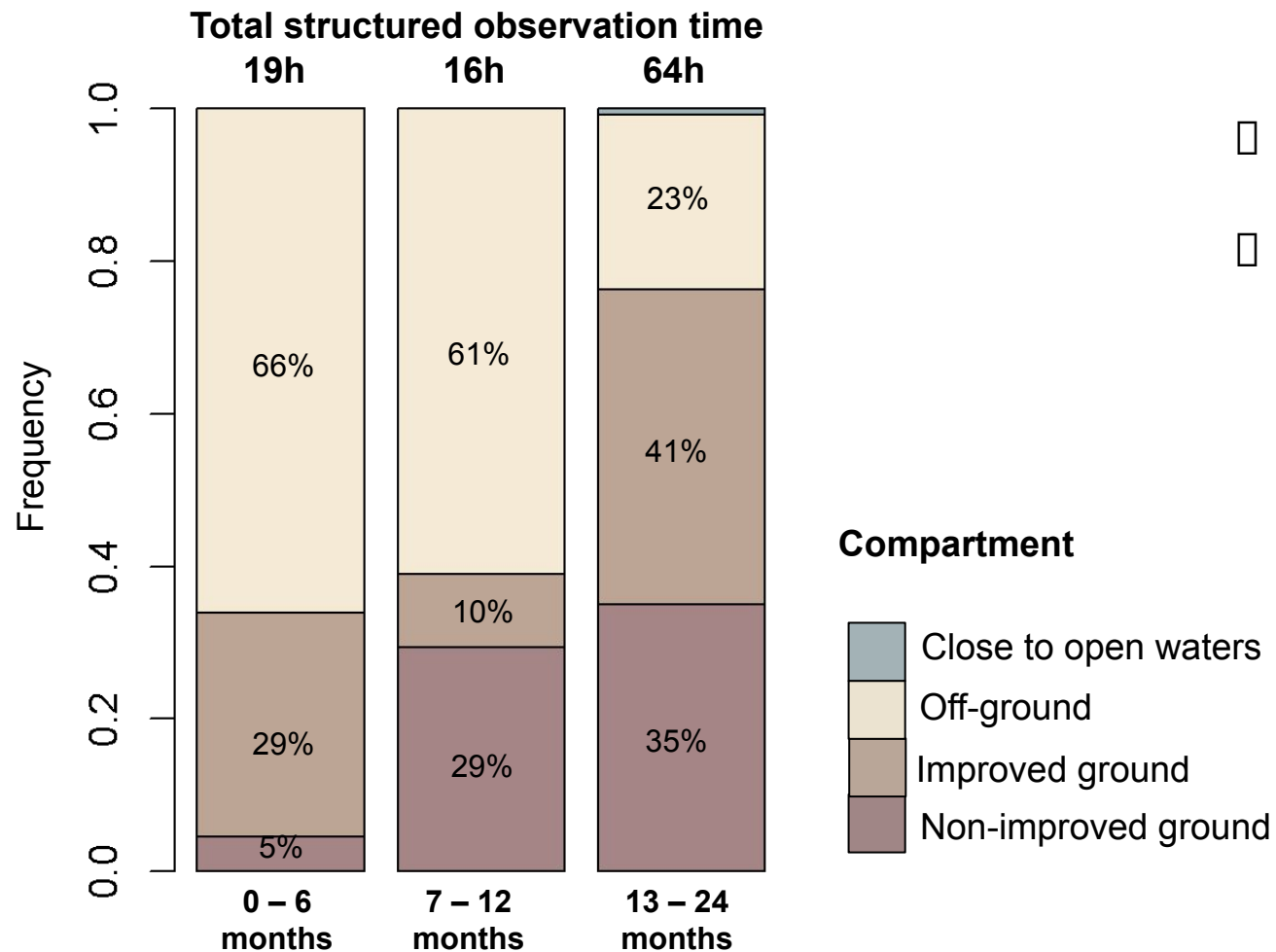


Most of the children stayed around the house



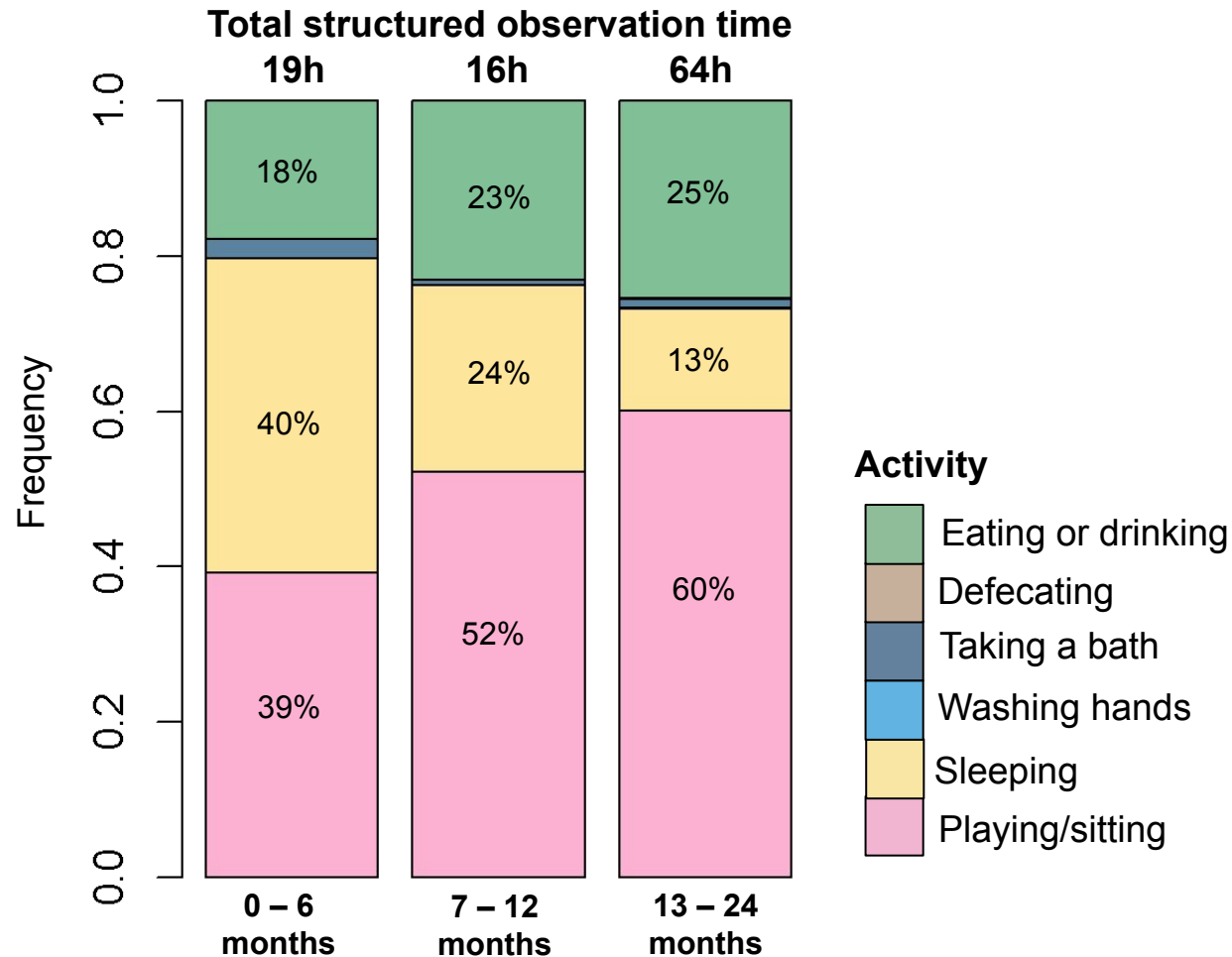
- Children spent a limited time in the kitchen
- Observation bias: we arrived in the field around 9-10 am, and people working in the fields had already left

As children grow, they spend more time on unimproved ground



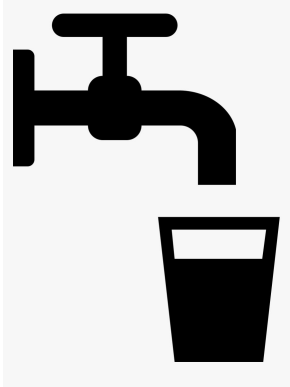
- Older children spent less time off-ground
- Very few children were observed close to open water

During our observations, children spent their time eating, playing, and sleeping



- Children spent very little time washing their hands (only 3 children among 35 were observed washing their hands at any point)
- Observations typically took place between 11am and 3pm: explaining why children spent a quarter of their time eating and drinking

Poor access to WASH



~ **30%** of households have access to an **improved water source** (piped water, or protected well or source)



58% of households are practicing **open defecation**

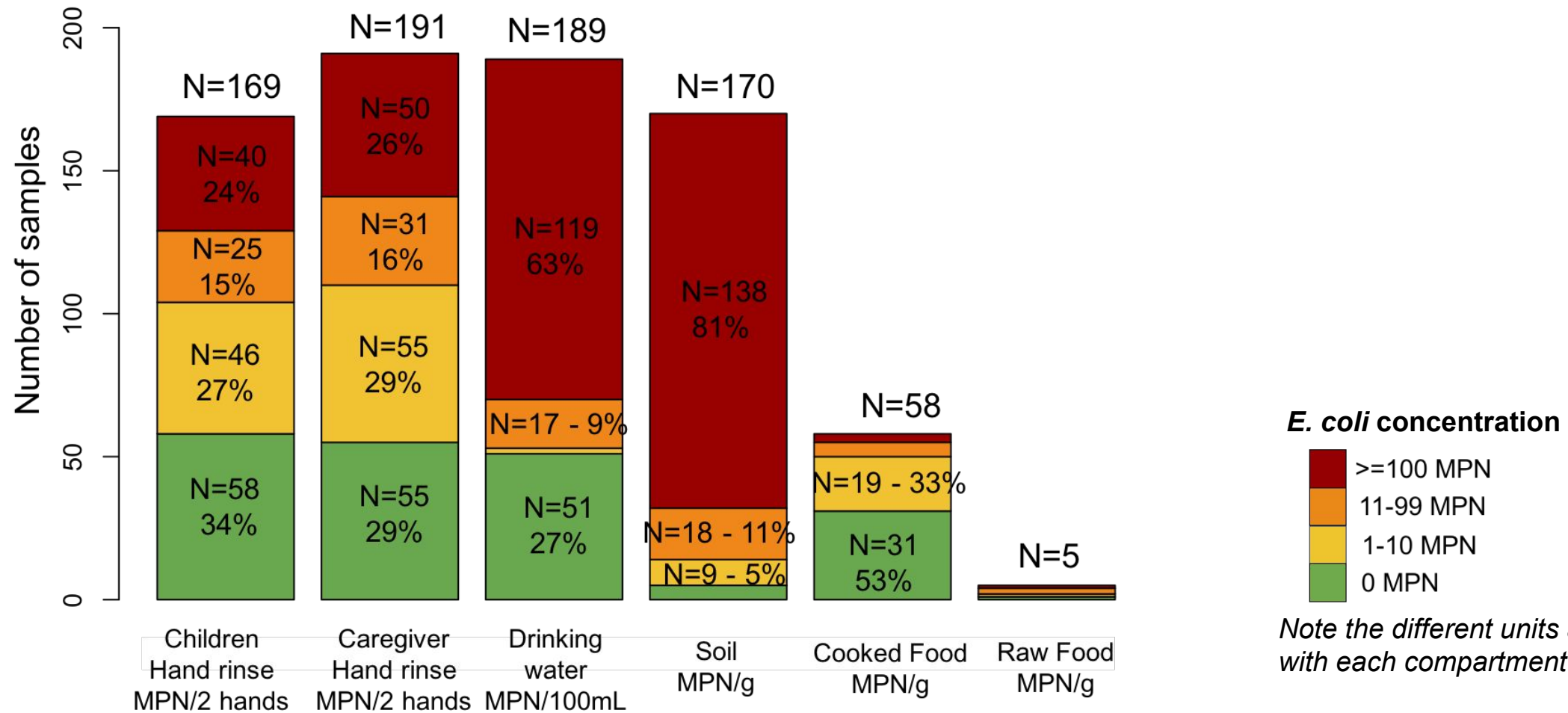


10% of households have a **handwashing station**

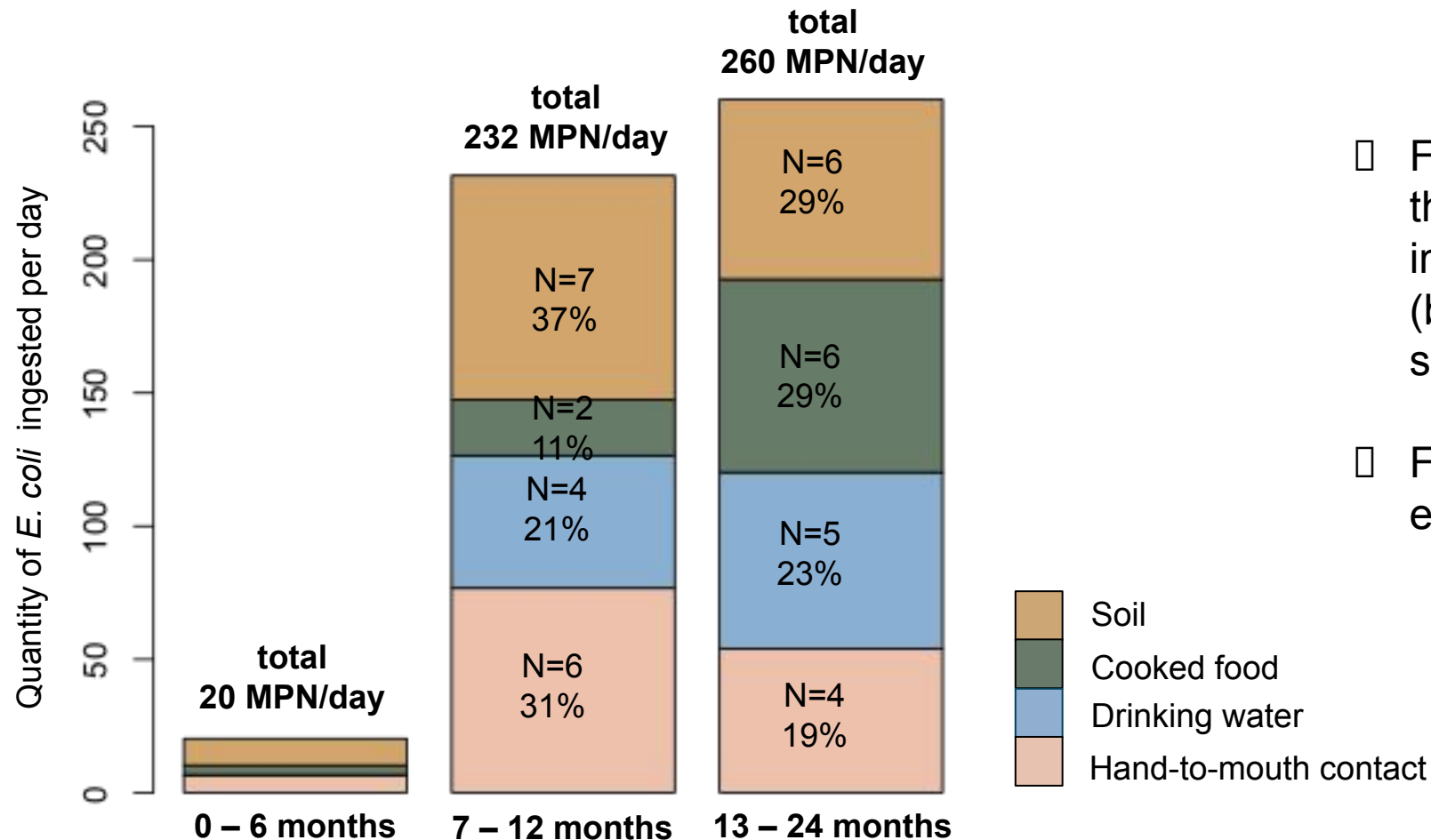


About **70%** of caregivers reported at least one episode of **diarrhea** per year among children in the 7-24 months age categories

Drinking water and soil are both highly contaminated compartments

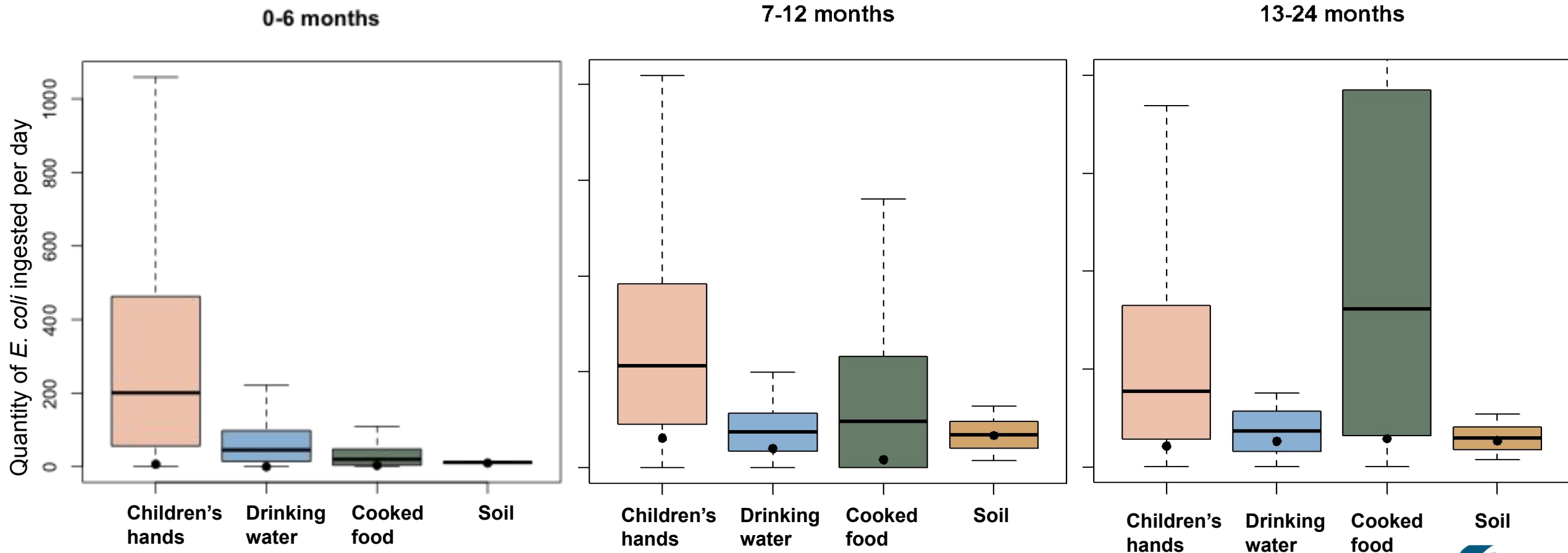


Exposure assessment: Ingestion of *E. coli* increased with children's age



- For the 7-12 months category: all the exposure pathways are important except cooked food (because a number of children are still breastfeeding)
- For the 13-24 months category: all exposure pathways are important

However, uncertainties* are high, especially when we consider findings from other studies



* box plots represent the range of uncertainties based on literature values, while the black dots show our estimate based on field data

Pathogens Analysis

We sent ~100 samples (drinking water, soil, children's hand rinse, children and animal feces) to Institut Pasteur Madagascar to analyze 7 different pathogens via qPCR:

- *Campylobacter*
- *Shigella*
- *Salmonella*
- Rotavirus
- Adenovirus
- *Entamoeba Histolytica*
- *Giardia Intestinalis*

Samples are still being analyzed at Institut Pasteur.

Recommendations



Strengthening FLOVANA's work to induce sustainable behavior change

- 1) **Identify bottlenecks in behavior change:** people might be aware of good hygiene practices but do not implement them in their day-to-day life.
- 2) **Promote communities' own solutions as well as “model households”** to encourage other households to adopt safer hygiene practices. This can be done through regular community consultation meetings led by a local leader, where people can share ideas to improve hygiene at their home.
- 3) **Support and develop household action planning:** field workers (or health agents) can visit households and help them develop detailed action plans tailored to household needs (e.g. improving latrine usage, building handwashing stations, or developing specific hygiene practices such as using reusable diapers for children).

We would also recommend focusing on the 7-24 months age categories, as they ingested a significantly higher number of E. coli per day

Drinking water: ~20% of *E. coli* ingested per day

- 1) **Develop and encourage access to improved water sources.**
- 2) **Treat water at the point of collection:** for example, through passive in-line chlorination systems or chlorine dispensers
- 3) **Strengthen awareness of water contamination at the point of use:** help to identify one or two types of containers that should only be used for drinking water, and try to increase access to containers with a lid and a small opening such as a jerry can to encourage pouring water instead of scooping.
- 4) **Strengthen general awareness about water contamination:** develop awareness campaigns to visually reinforce knowledge about water flow and stop the belief that water never gets dirty.

Soil ingestion: ~30% of *E. coli* ingested per day

- 1) **Animal husbandry interventions:** confine animals to areas where children would be discouraged from playing.
- 2) **Reducing open defecation:** combine intensive health promotion campaigns (like CLTS) with subsidies to improve access to sustainable and safe latrines.
- 3) **Improved flooring:** develop the use of “balotom” – a small, easy to wash piece of fabric that can be placed on top of mats where children spend their time.

Hand-to-mouth contact: 20-30% of *E. coli* ingested per day

- 1) **Strengthening awareness:** increase knowledge of risks associated with child mouthing behaviors. Hold group discussions to talk about appropriate solutions that can interrupt this pathway, and use visualization tools (such as glitter) to represent contamination.
- 2) **Development of handwashing stations:** support and promote the construction of low-cost handwashing stations with local materials. Continue developing local businesses to produce soap.

Cooked food: 11-30% of *E. coli* ingested per day

1) **Encourage good hygiene practices:** develop food hygiene interventions that focus on handwashing before food preparation, safe food storage, and disinfection of utensils. Develop awareness about contamination introduced through domestic animals (no animals should enter the kitchen or the house more broadly).

Conclusions



Conclusions

- The estimated daily intake of pathogens increased with age: as children grow, they interact more with their environment, eat more food, and drink more water, increasing the chance of ingesting fecal matter
- The main exposure pathway also varied with age:
 - main exposure pathway for children <6 months: Soil
 - main exposure pathways for children 7-12 months: soil, hand-to-mouth contact, and drinking water
 - main exposure pathways for children 13-24 months: all pathways played an important role in *E. coli* ingestion
- **Recommendations:** access to safe WASH services was very low in the three studied regions. We would recommend to develop and strengthen the WASH infrastructures (disinfection of water, limiting open defecation...) as well as awareness campaigns to induce sustainable behavior change. Future work should also focus on limiting contamination by livestock (e.g., confining animals to areas where children would be discouraged from playing) to reduce the load of contaminants present in the environment.

Q&A Session

Thank you!

Join us for our next webinars in the series:

Part II on November 17, 2022

Part III on December 6, 2022

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